

WEATHER AND CIRCULATION OF MARCH 1973

Record Heavy Precipitation Over the Central and Southern Great Plains

ROBERT E. TAUBENSEE—National Meteorological Center, National Weather Service,
NOAA, Suitland, Md.

1. MEAN CIRCULATION

The mean 700-mb circulation for March 1973 was substantially different from the pattern of February 1973 (figs. 1–3). Much of the circulation change can be attributed to an eastward displacement from February to March of major wave components at midlatitudes around the Northern Hemisphere.

The blocking High north of Siberia was one of the more important features of the March circulation. This High was instrumental in driving cold arctic air southward along the Asiatic coast and out over the warm water of the western Pacific. As a result, the southern portion of

the preexisting western Pacific trough strengthened and a Low developed in the Bering Sea. Amplification of the mean trough in the western Pacific was accompanied by the building of a strong midlatitude ridge over the east-central part of the ocean.

The mean 700-mb circulation over North America during March 1973 was essentially reversed from that of February (Dickson 1973). A broad double-trough became entrenched over the southwestern and central United States as mean height departures fell sharply over the western half of North America in March. A blocking ridge was present over eastern North America during March, having replaced a mean trough that moved eastward into

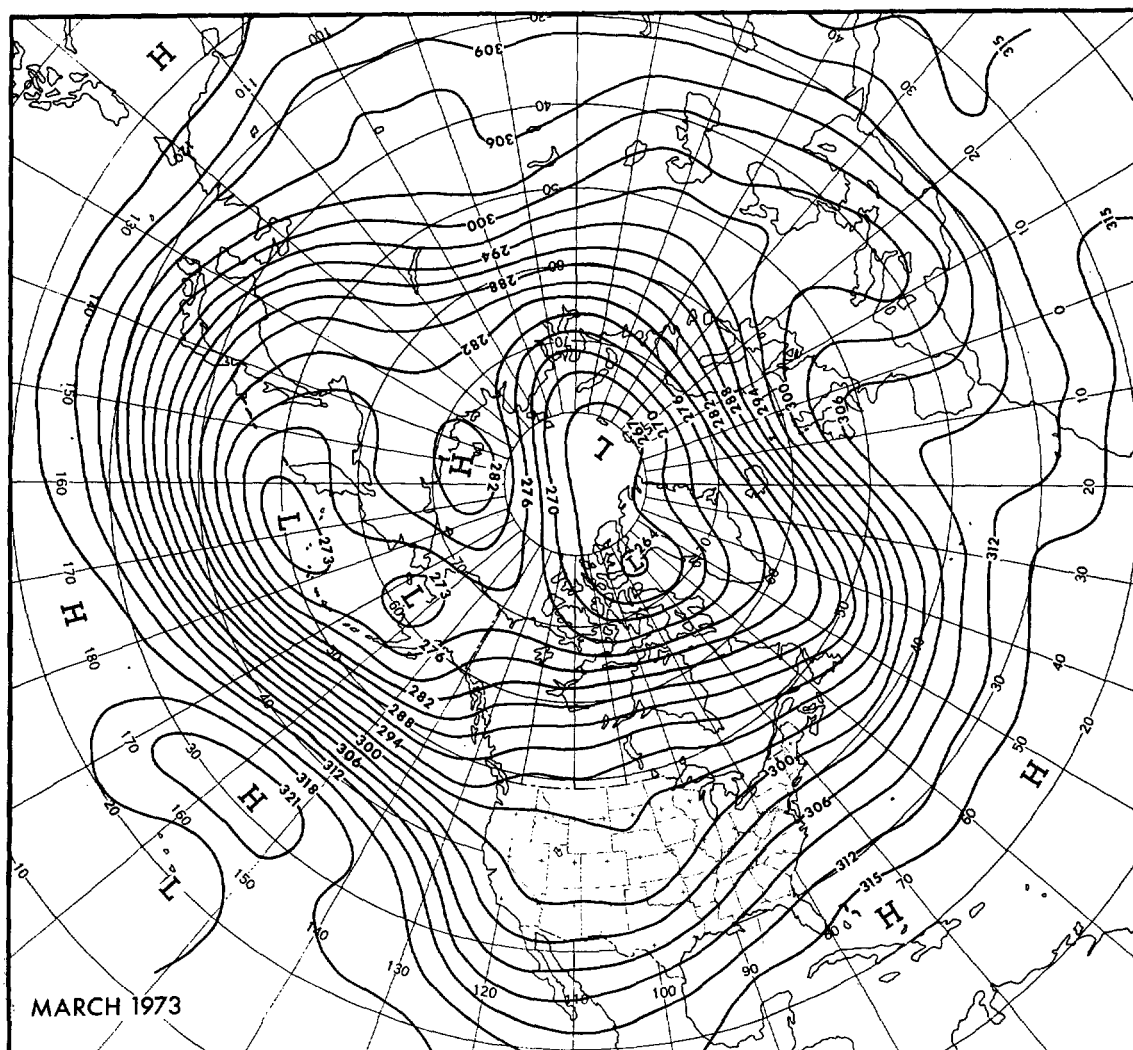


FIGURE 1.—Mean 700-mb contours in decameters (dam) for March 1973.

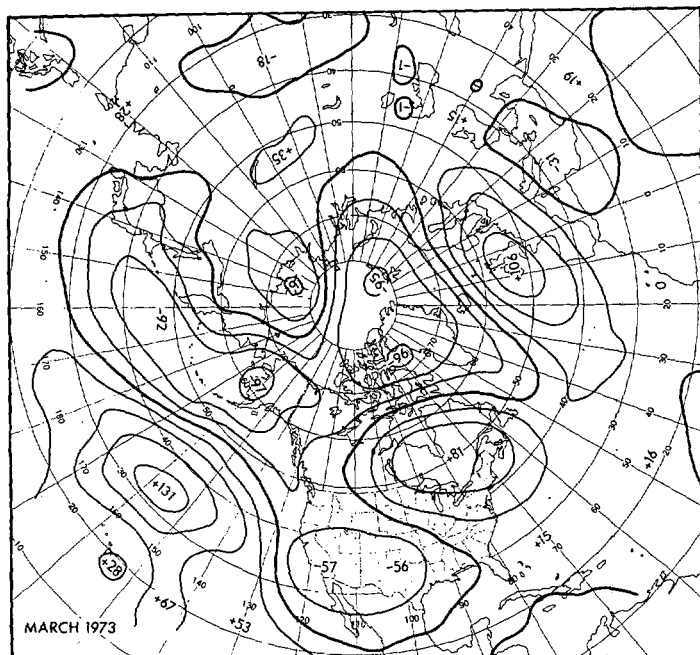


FIGURE 2.—Departure from normal of mean 700-mb height in meters (m) for March 1973.

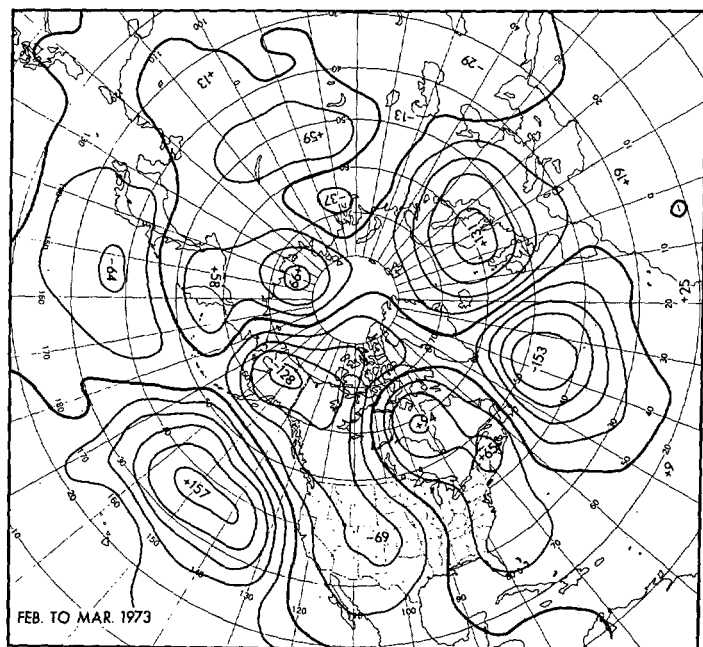


FIGURE 3.—Mean 700-mb height anomaly change (m) from February to March 1973.

the western Atlantic. The trough, however, still maintained a connection with the stationary Low in the Davis Strait.

A blocking ridge was centered over the British Isles during March while a trough remained over the Mediterranean Sea. Mean height departures over much of Asia were relatively small, as they had been in February. The trough near Novaya Zemlya sharpened as it moved eastward from its February position and gave support to the strong Siberian ridge.

Despite the radical change in the mean circulation that occurred over North America from February to March,

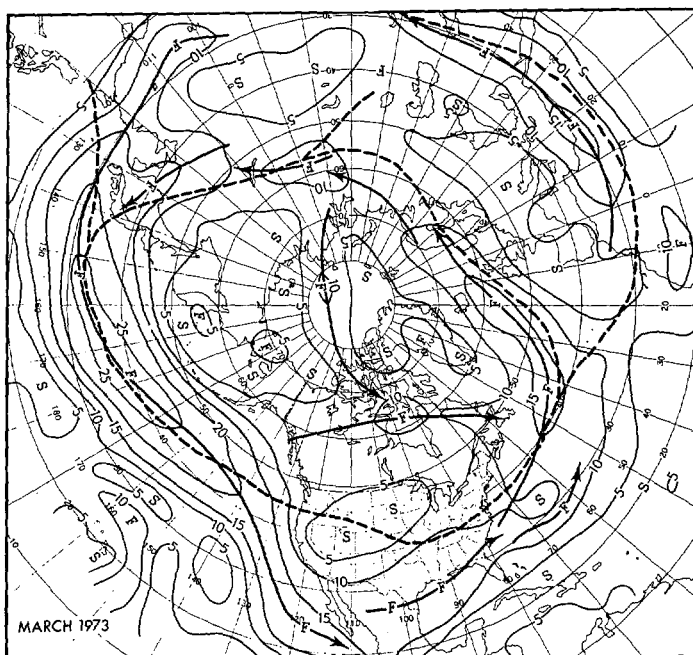


FIGURE 4.—Mean 700-mb geostrophic wind speed (m/s) for March 1973. Solid arrows show the observed axes of maximum wind speed, and dashed lines show the normal.

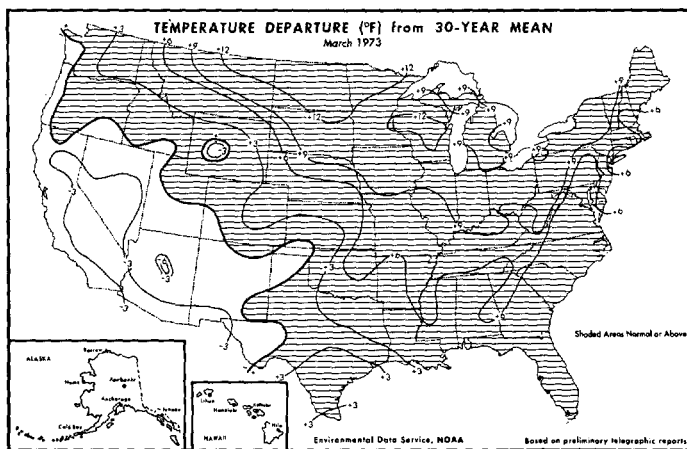


FIGURE 5.—Departure from normal of average surface temperature (°F) for March 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

the axis of maximum 700-mb wind speed remained in about the same position as it had been during February. Although somewhat fractured, the major wind speed maximum extended from the eastern Pacific across northern Mexico and the southern United States (fig. 4), far south of the normal March position. A secondary maximum stretched across central Canada as the mean westerly flow tended to diverge near the Pacific coast.

2. TEMPERATURE

Mean surface temperatures over the United States during March 1973 averaged above normal except in the Southwest and along the Pacific coast (fig. 5). This generally higher than normal temperature pattern was associated with above-normal mean 700-mb heights and stronger than normal mean southerly flow that accom-

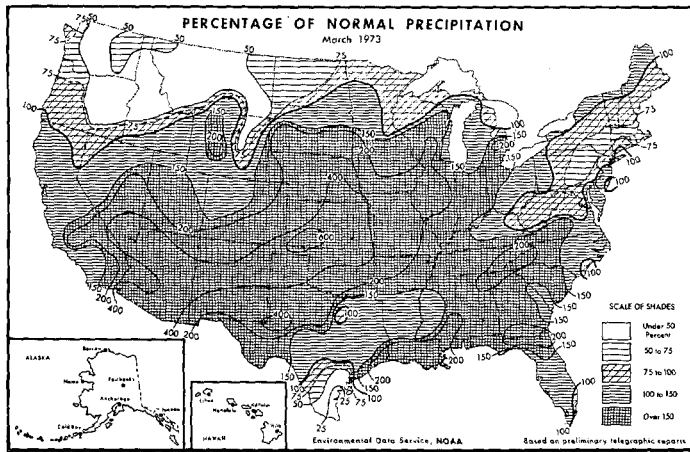


FIGURE 6.—Percentage of normal precipitation for March 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

panied the strong ridge over eastern North America (fig. 2). This month was the warmest March since 1946 at a number of stations from the Southeast into the Northern Great Plains; it was the warmest March since 1910 at Bismarck, N. Dak.

The mean trough over the southwestern United States was accompanied by repeated influxes of cooler than normal mP air into the region throughout March. The cool air was persistent enough in Arizona to bring about the coldest March on record at both Flagstaff and Tucson. In addition, maximum temperatures at Yuma failed to reach 80°F during March for the first time in the history of the station.

3. PRECIPITATION

Precipitation was heavier than normal over much of the country during March 1973 (fig. 6). Precipitation totals from the Southwest into the Great Plains were more than four times the March normal, breaking long-standing March records at numerous stations within the region (table 1).

This excessive precipitation was associated with short-wave upper level and surface cyclonic disturbances that followed a similar route through the mean 700-mb trough. The storm track extended from Nevada through the Texas Panhandle and into the region of the Great Lakes.

Instances of local flash flooding were common during the month in many areas of the country. At the end of March, major flooding was in progress along the Mississippi and Missouri Rivers due to the heavy rains and runoff from saturated soils.

In contrast, March precipitation was less than normal in the Northwest and along most of the northern border of the United States as storm systems were shunted either north or south of the region. Precipitation was also below normal in southern Texas and in part of the Northeast near the axis of the mean 700-mb ridge.

March snowfall was greater than normal over parts of

TABLE 1.—Record and near-record precipitation during March 1973

Station	Amount (in.)	Departure (in.)	Remarks
Flagstaff, Ariz.	77.4	—	Snowiest March
Peoria, Ill.	6.95	+4.10	Wettest March
Springfield, Ill.	7.89	+5.01	Wettest March since 1898
Sioux City, Iowa	4.02	+2.56	Wettest March
Dodge City, Kans.	8.84	+7.68	Wettest March back to 1874
Topeka, Kans.	8.44	+6.43	Wettest March back to 1888
Columbia, Mo.	10.09	+7.44	Wettest March back to 1890
Grand Island, Nebr.	5.57	+4.30	Wettest March
Norfolk, Nebr.	5.14	+3.55	Wettest March back to 1896
Omaha, Nebr.	5.96	+4.51	Wettest March back to 1871
Albuquerque, N. Mex.	2.18	+1.70	Wettest March
Do.	13.9	—	Snowiest March
Tulsa, Okla.	11.94	+9.51	Wettest March back to 1888
Sioux Falls, S. Dak.	3.52	+1.98	Wettest March back to 1893
Knoxville, Tenn.	10.24	+5.51	Wettest March since 1917
Wichita Falls, Tex.	3.89	+2.35	Wettest March
Madison, Wis.	5.04	+3.20	Do.
Lander, Wyo.	3.02	+1.87	Do.
Do.	49.5	—	Snowiest March
Sault Ste. Marie, Mich.	0.2	—	Least March snowfall
Havre, Mont.	0.03	−0.57	Driest March
Yakima, Wash.	0.01	−0.61	Do.

the central and southern Rocky Mountains, and a few stations within the region reported record snowfall totals for the month (table 1). Over much of the country, however, snowfall was much less than normal due to the preponderance of relatively warm temperatures during the month.

4. WEEKLY VARIABILITY

February 26–March 4

Many characteristics of the mean monthly 700-mb circulation were already present during the first few days of the month (figs. 1, 7A). The major exception was over North America where a broad ridge prevailed over much of the continent.

Mean surface temperatures for the week (fig. 7B) averaged well above normal over almost the entire country in keeping with the mean ridge aloft. The trough off the Atlantic coast was near enough to New England, however, to bring lower than normal temperatures to part of that region.

Heaviest precipitation during the week (fig. 7C) was associated with the active 700-mb trough along the Pacific coast as well as the weak trough over the Great Plains.

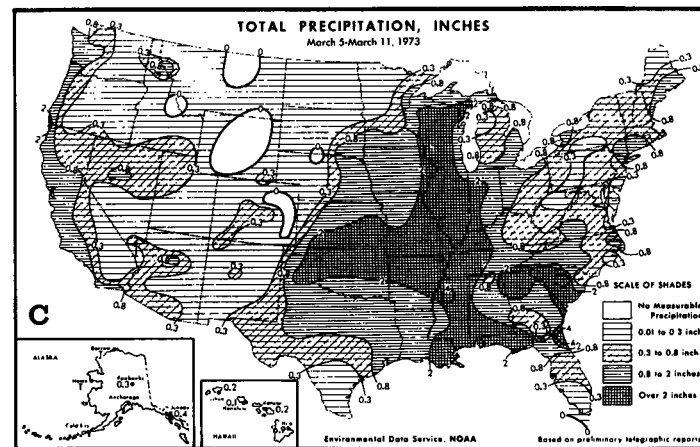
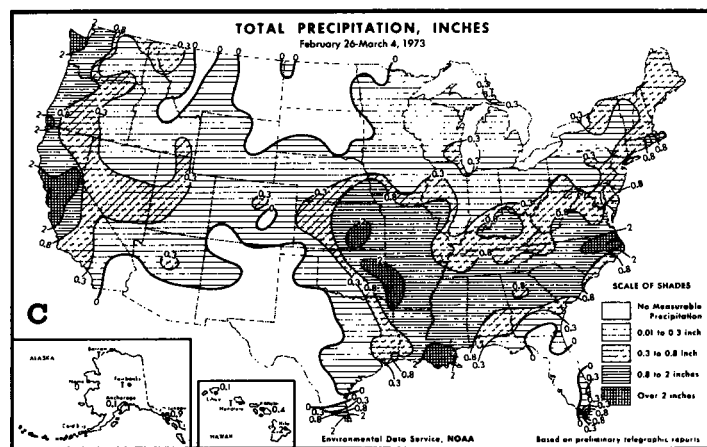
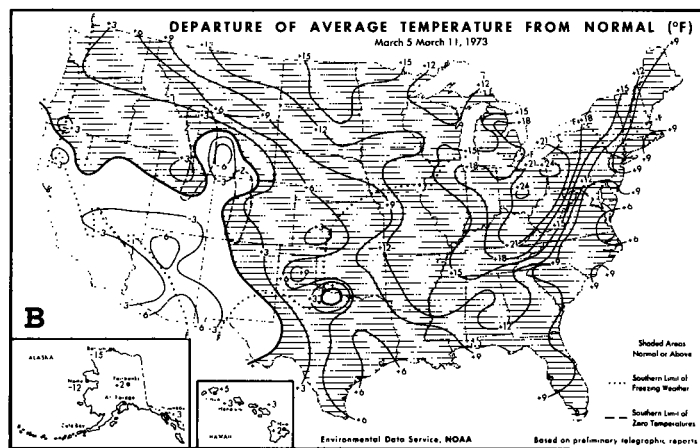
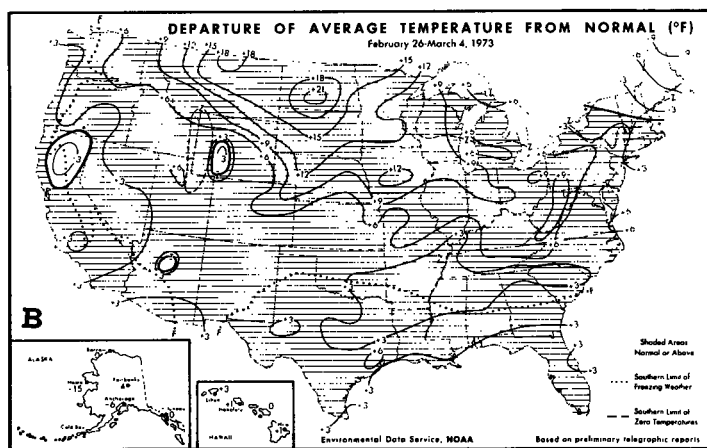
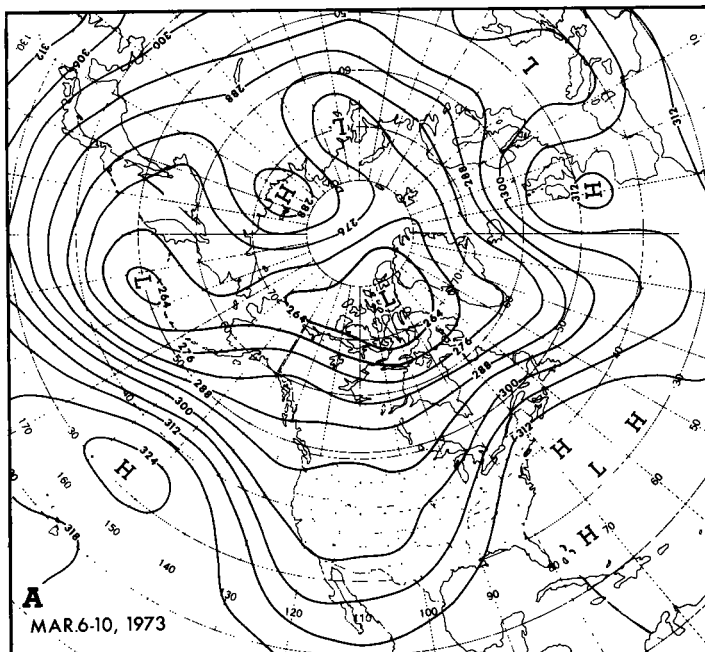
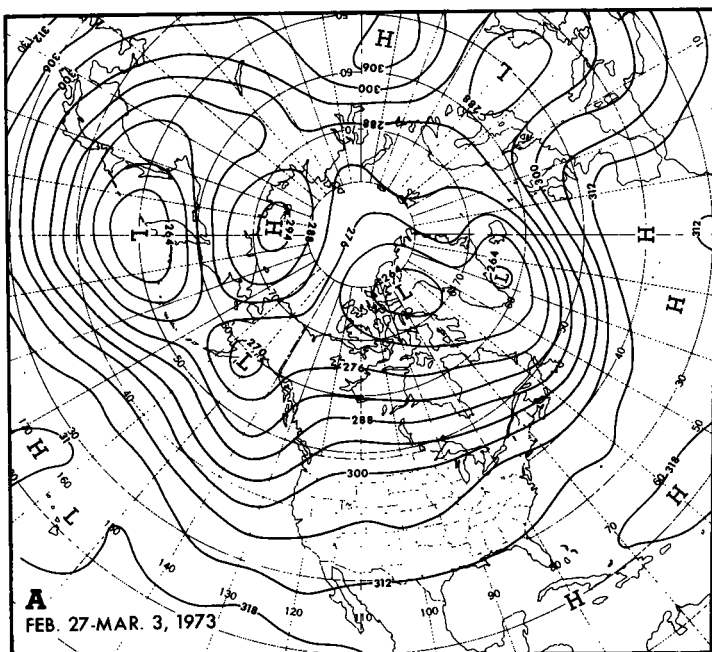


FIGURE 7.—(A) mean 700-mb contours (dam) for Feb. 27–Mar. 3, 1973; (B) departure from normal of average surface temperature (°F) and (C) total precipitation (in.) for week of Feb. 26–Mar. 4, 1973 (from Environmental Data Service and Statistical Reporting Service 1973).

March 5–11

The mean 700-mb circulation during this first full week of March (fig. 8A) was similar in phase to the monthly

FIGURE 8.—Same as figure 7, (A) for Mar. 6–10, 1973; (B) and (C) for week of Mar. 5–11, 1973.

pattern around the entire Northern Hemisphere. Eastward motion over the Pacific Ocean and amplification of the eastern Pacific ridge combined to drive cyclonic vorticity into the southwestern United States and northern

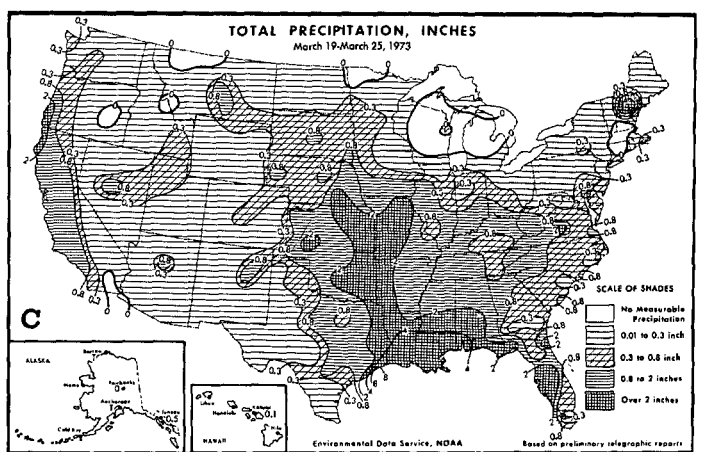
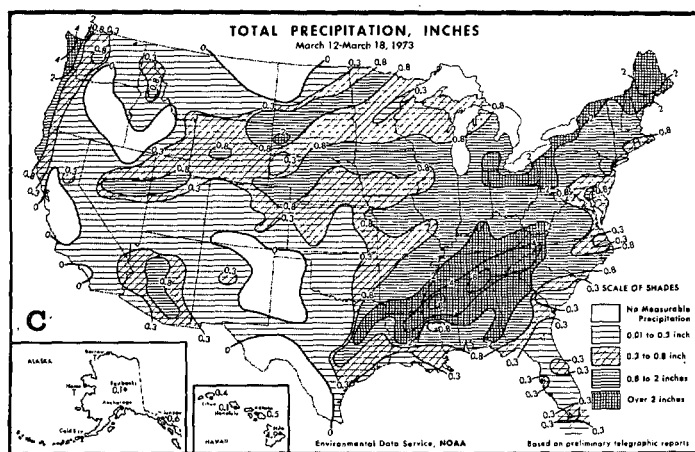
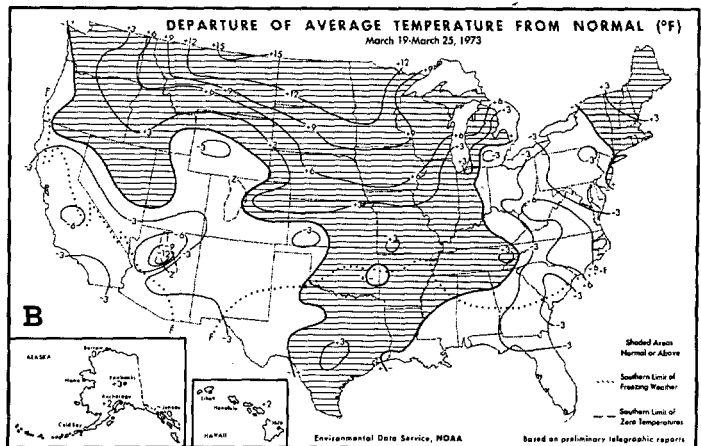
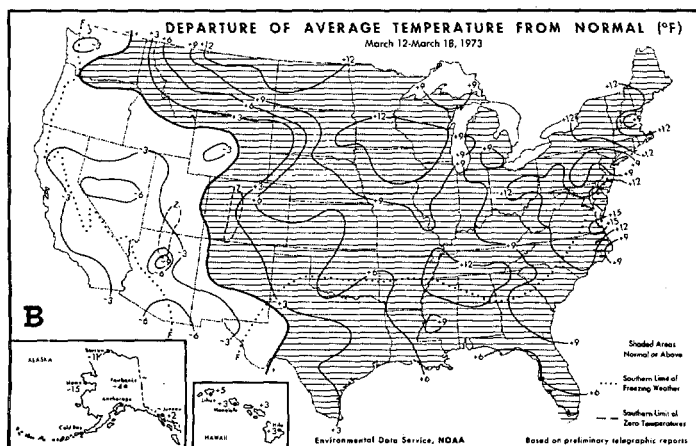
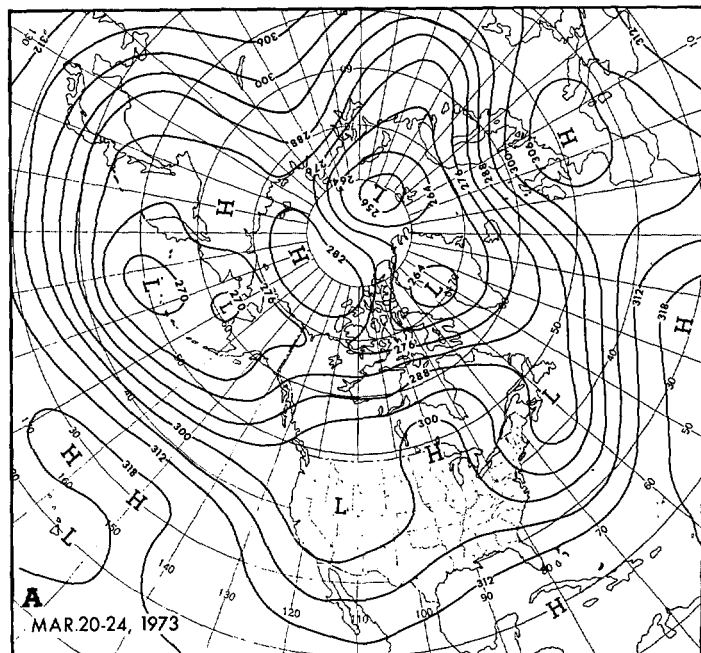
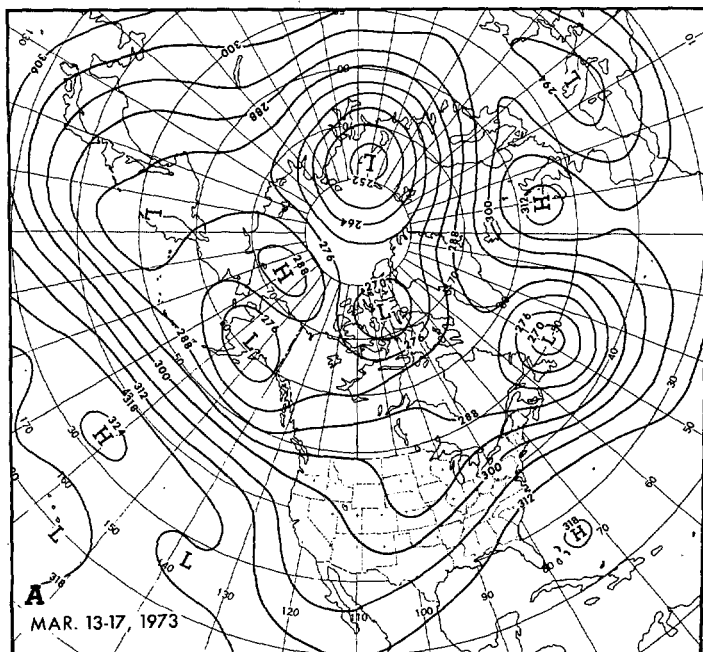


FIGURE 9. Same as figure 7, (A) for Mar. 13-17, 1973; (B) and (C) for week of Mar. 12-18, 1973.

FIGURE 10.—Same as figure 7, (A) for Mar. 20-24, 1973; (B) and (C) for week of Mar. 19-25, 1973.

Mexico during the week. The midlatitude ridge near eastern North America was also well-established by this period.

Temperatures over the Southwest cooled to below normal this week (fig. 8B) as relatively cold mP air entered the overlying mean trough. Elsewhere over the

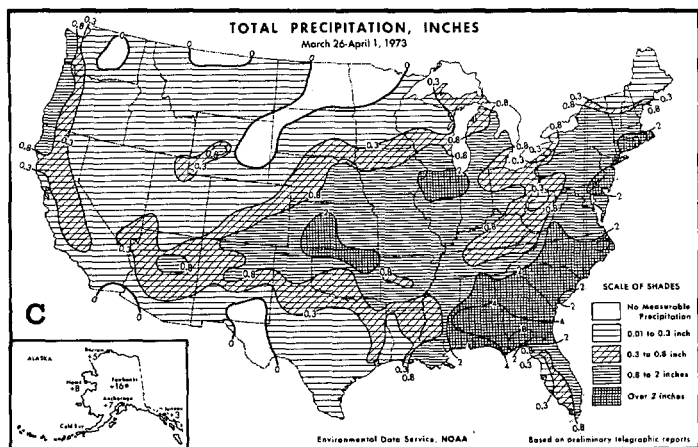
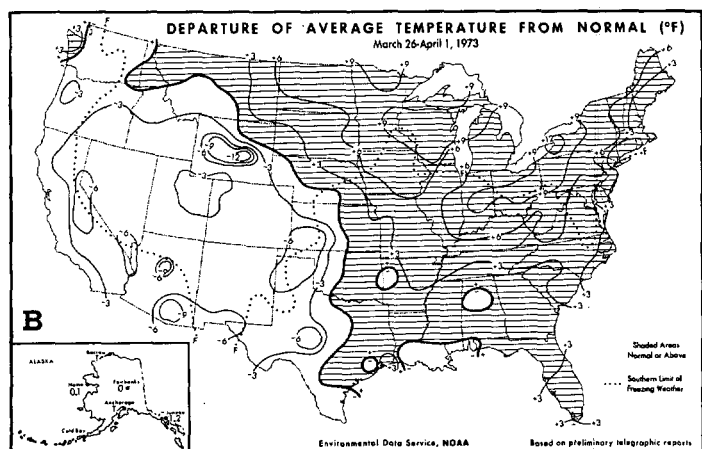
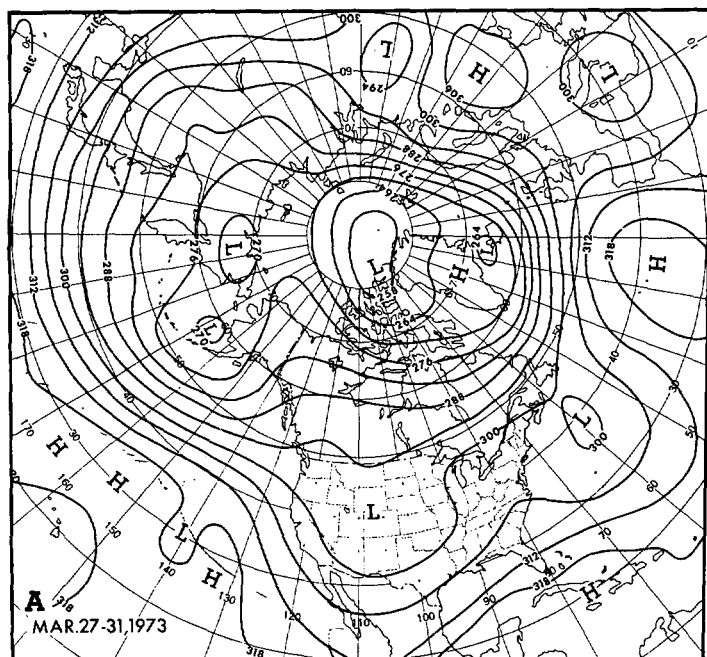


FIGURE 11.—Same as figure 7, (A) for Mar. 27-31, 1973; (B) and (C) for week of Mar. 26-Apr. 1, 1973.

country, mean temperatures averaged well above normal. Temperature departures were more than 15°F higher than normal from Tennessee to the Great Lakes as mean

southwesterly winds aloft advected warm air into the area.

Total precipitation this week exceeded 2 in. over much of the Mississippi Valley region and over sections of the Central and Southern Great Plains (fig. 8C). This precipitation occurred to the east of the mean 700-mb trough in the area of strong warm air advection. Heavy rainfall along the south Atlantic coast and into northern Georgia was associated with frontal activity and easterly flow along the coast.

March 12-18

The mean 700-mb flow over the Pacific flattened this week at midlatitudes as a mean Low over Alaska reduced mean heights in the Gulf of Alaska (fig. 9A). Anticyclonic vorticity moved into western North America while the midlatitude trough over the United States sharpened as it moved eastward. The ridge over eastern North America was considerably weaker this period in response to cyclonic activity that moved across Canada and into the intense Low near Newfoundland.

The area of below-normal temperatures in the western United States expanded northward this week (fig. 9B) while the warm air over the rest of the country generally moderated somewhat from the strong departures of the previous week. Even so, mean temperatures still averaged more than 6°F higher than normal over about half of the country.

Precipitation during this week (fig. 9C) was primarily attributable to the effects of two huge low-pressure systems. The first storm formed over the southern Rocky Mountains and then moved northeastward to the Great Lakes. Near blizzard conditions occurred to the north of the Low in the Rocky Mountains and the Northern Great Plains. At least 21 tornadoes occurred over the central part of the Nation in connection with the storm.

The second Low developed as a frontal wave over the Lower Mississippi Valley and deepened rapidly as this storm also moved northeastward. The Low caused torrential rains in a band from Louisiana into the central Appalachians and dropped more than 6 in. of snow from the Great Lakes to Maine. Wind-driven waves caused flooding and property damage along the shores of Lakes Erie and Ontario.

March 19-25

Cyclogenesis along the east coast of the United States during this period was associated with a deep mean 700-mb trough over the western Atlantic and a mean Low near Nova Scotia (fig. 10A). A trough was again positioned over the southwestern United States, while an amplified ridge extended northeastward from the central States into Canada.

Weekly mean surface temperatures averaged below normal over part of the East during this period (fig. 10B) in response to mean northwesterly flow aloft. The area

covered by below-normal temperatures in the West expanded eastward this week while temperatures warmed to above normal over most of the Northwest.

Heavy precipitation along the gulf coast and northward from eastern Texas (fig. 10C) was mostly associated with a storm located over the middle Mississippi Valley at the end of the week.

March 26–April 1

Eastward motion of the existing components of the mean circulation yielded a return to a trough in the West and ridge in the East pattern over the United States during the last few days of March (fig. 11A).

Mean surface temperatures for the week were below normal over much of the West (fig. 11B). Above-normal temperatures predominated over the East as well as in the Northern Great Plains and northern Rocky Mountains.

Although weekly precipitation was relatively heavy in the vicinity of the broad mean trough, the heaviest totals were observed in the Southeast (fig. 11C). This heavy precipitation was related to a short-wave trough and cold front that moved across the area at the end of the month. Strong convective activity accompanied the passage of this front and resulted in outbreaks of severe weather in the East. A rare tornado caused property damage in a Virginia suburb near Washington, D.C. on April 1.

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